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STUDIES OF THE FOULING COMMUNITIES ALONG ARGENTINE COASTS

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Comprehensive information on investigations of fouling communities made since 1965 along the Argentine coasts is exposed in the present paper. Studies were made on experimental rafts located in two main harbours: Mar del Plata (38°03'17" S, 57°31'18" W) and Belgrano (38°54' S, 62°06' W). Both areas, of temperate-cold waters show very aggressive communities practically during the whole year.

General hydrological conditions of both areas are compared, and attachment cycles of the main fouling species are presented.

Several ecological aspects are considered, such as trophic relations of the community, role and growth rate of certain species, ecological succession, etc. Fouling development on short term panels seems to be regulated by the water temperature in Mar del Plata's area, as other ecological factors do not modify too much during the year. On the contrary, Belgrano's harbor fouling communities are exposed during the year to great variations in several hydrological factors.

Key words: Fouling communities; experimental raft tests; ecological succession; hydrological characteristics of Argentine harbors; powerstation fouling communities.

1. Introduction

The Laboratorio de Ensayo de Materiales e Investigaciones Tecnológicas (LEMIT), together with the Instituto de Biología Marina and the economical aid of several institutions, has been conducting marine fouling studies at several sites on the Argentine coasts since 1965. These studies, carried out by a group of biologists and chemists, have been directed at gathering comprehensive information on the fouling communities' dynamics and its control by antifouling paints.

Fouling studies on the experimental raft were begun in Mar del Plata's harbor and

continued without interruptions until the present. Many contributions of that studied area were published in the lastfew years.

Our second experimental raft was anchored in Belgrano's harbor after preliminary studies that indicated the importance of fouling in the area. Recently the first year of raft observations was completed and we intend to continue with the investigations in the area during the next years. Preliminary observations were also made at a powerstation located in Quequen's harbor which had severe fouling problems in its refrigerating system.

Extending our information to southern areas, preliminary data was obtained from Madryn's harbor, in our Patagonian coast. Due to the lack of an experimental raft in that area, fouling samples were obtained from the piles of the wharf (the only harbor construction) and from two wrecks in the surrounding area. These preliminary observations seem to be important, as the patagonian coast is unknown with regards to its fouling communities and at present an important deep-water harbor related with industrial activities is under construction in the same area and will in a few years of service change, without any doubt, the ecological factors of the area.

Our fouling studies will develope in the future not only covering new sites of the Argentine coasts, but also trying to obtain a deeper knowledge of the studied areas. This will be a kind of challenge for our scientific group, as the flora and fauna of our country is not yet deeply known, which is one of the reasons why ecological studies sometime go rather slowly. And of course it is not neccessary to mention the difficulties in many cases to obtain the neccessary economical support.

Due to the justified regulations of the congress regarding contributions, the present paper tries to give only a brief general view of fouling along Argentine coasts that could be extended by any interested person by reading previously published results, and others that will be published in the future.

2. Mar del Plata's harbor

This is the better known area in fouling aspects, as it was the first place choosen for our investigations. This port, one of the most important along our coasts is mainly dedicated to fishery aspects and overseas commercial traffic.

Settlements of special benthic communities are conditioned by the particular environment of the harbor, and are clearly differentiated from those inhabiting the natural surrounding areas. The most distinctive hydrological characteristics of this harbor are: slight turbulence, slightly lower salinity than in neighboring areas, lower pH, dissolved oxygen and a high content of organic detritus. The water temperature varies within a range of about 15° C annually. Full details of the harbor construction and environmental characteristics have been given in previous papers (1, 2).Graphs of the principal hydrological factors in this harbor are included in another paper presented to this Congress (3) and in Fig. 6.

Since the firts tests, attachment cycles of the main fouling species have been registered. Summarizing the information, we include in this opportunity some graphs obtained along three consecutive years (1966-69) for the principal species at four different levels, from surface to 2 meters depth (Fig. 2 and 3).

Ecological succession of fouling communities can be clearly observed through long term panel samples. However very important stages in the evolution of the communities also takes place in extremely short periods. In those areas of aggressive foul-

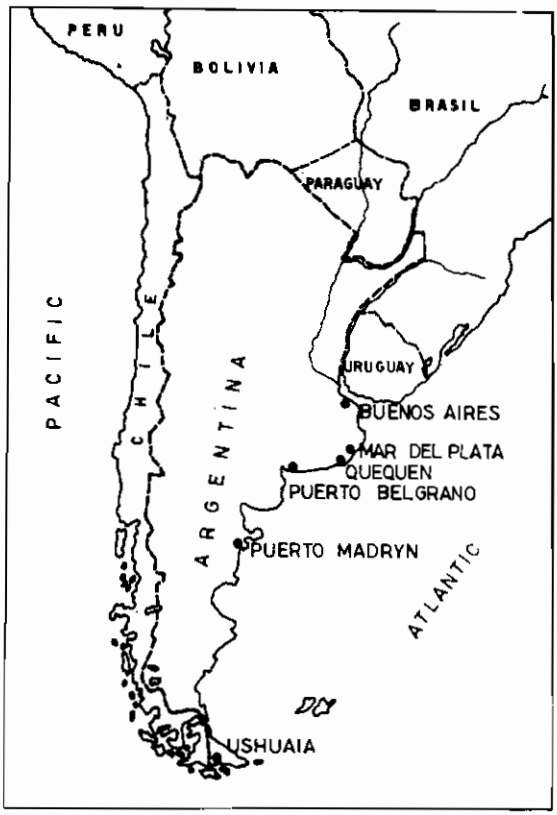


Fig. 1

Harbors studied in the Argentine coasts

ing they can only be detected by obtaining samplee in short periods of around 5-10 days.

Based on our observations on ecological succession of fouling communities (2, 4) we considered it of great importance to determine the several stages forming the period from the moment the substratum is immersed until the destruction of the fouling community. Unfortunately until the moment there has been no universal criteria by which to define the principal etages of evolutionary processes of fouling communitiee, although this could be very useful for comparing data obtained in different geographical areas. This could be used as another element for comparing grades of aggressiveness, as this characteristic is not only determined by the species involved, but also by the speed in which fouling communities are formed.

Among the scarce information regarding stages of development of these benthic communities, we think that Kawahara's position is one of the best and also corresponds with our conclusions expressed in previous papers (2, 4, 5).

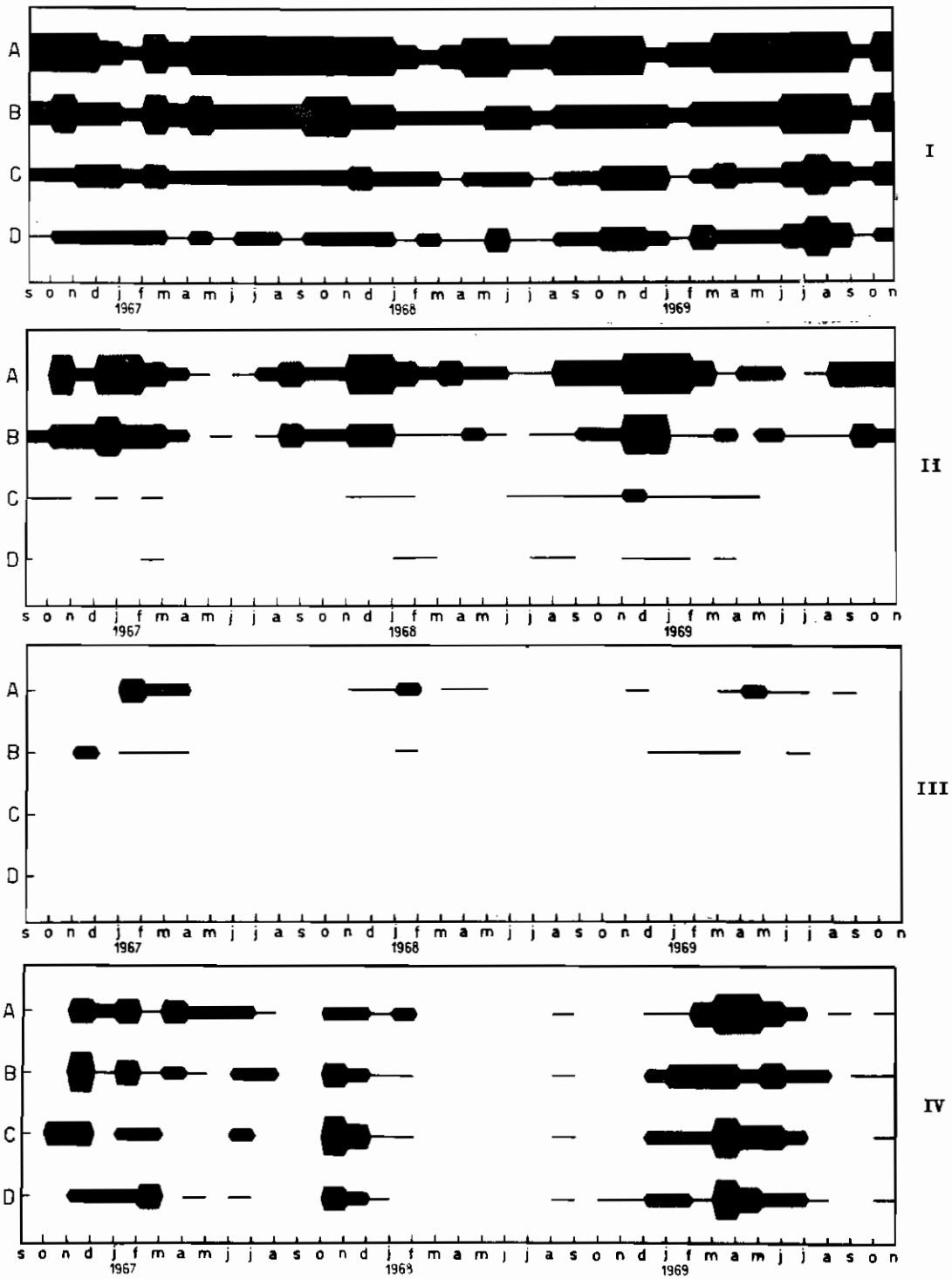


Fig. 2.- Diatoms (I), Enteromorpha intestinalis (II), Ulva lactuca (III) and Tubularia crocea

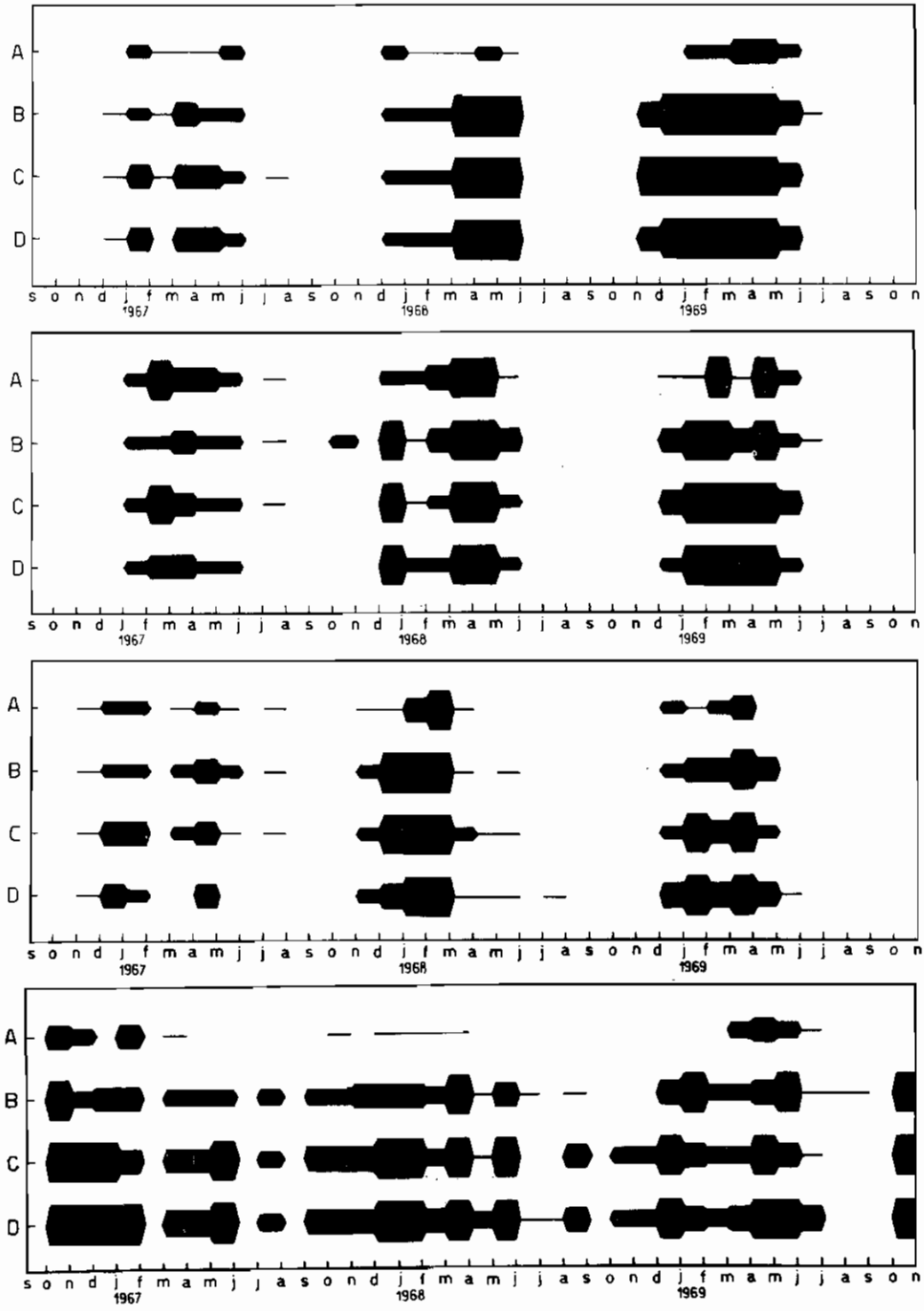


Fig. 3.- Serpulids (I), Balanus amphitrite and trigonus (II), Bugula sp. (III) and Ciona intestinalis (IV)

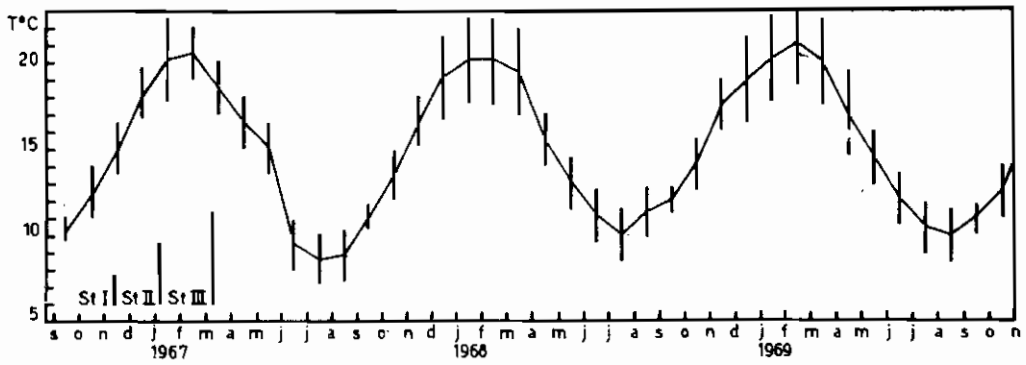


Fig. 4

Relations between stages and water temperature

Based on Kawahara's studies (5) and using our own information, we established six stages (I-VI) that include the whole cycle of fouling community development. In the particular case of Stage II we found necceesary to create three Substages: IIA, IIB and IIC (4).

Trying to study the different stages reached by fouling communities on monthly panels (short-term panels) during the whole year, we used the information gathered during three consecutive years (1966-69). Thought it, we could establish that in our area the maximun stage on monthly panels is stage III. By graphing together stagee and water temperature, a close correlation can be observed between both factors(Fig. 4). Another interesting fact is that substages of Stage II always precede and follow Stage I, following the oscilatione of mean water temperature. In this case, temperature seems to act as an inhibitor or diminisher of the sexual activity rythm of fouling species, rather than to directly affect the larval stages. On the contrary, Stage III is determined directly by the temperature of the same month, or the month before that provokes a massive sexual reproduction and a fast development of larvae and juvenils.

Due to the scarce information about water line level fouling communities and their important action on vessels, we etudied the scological role of Siphonaria lessoni, a Pulmonate Gastropod associated with the algae-belt. This species was simultaneously studied in neighboring natural areas (6), which allowed us to compare that information with that obtained on experimental floating substratum in the harbor area. This gave us interesting information about the importance of substratum slope in the vertical distribution of the species; the vertical distribution of larvae during the previous stage of attachment; the succeseional stage that the larvae needs for its association with a fouling community; the true limiting factors of vertical distribution of the species; the factors involved with different shapes of individual shells; the trophic spectrum and some other aspects of its ecology, recently published (7).

Among them we have to mention the peculiar role of Siphonaria lessoni ae a fouling organism, as this species is not harmful by itself, but creates suitable conditions for the settlement of other organisms which really are harmful and destroy the anticorrosive paint used at this level. The typical algae-belt found at water-line level, due to its density, eliminates or reduces in a great extent the possibilities of attachment of many invertebrates. In our area this fact is very clear with Balanus amphitrite. Adult populations of Siphonaria lessoni tend to reduce the covered surfa-

TABLE I

Stage	Substage	Months	Temperature	
I		September 1966 September 1967 September 1968 September 1969		11,2° C
II	II A	June 1967 July 1967 August 1967 June 1968 July 1968 August 1968 June 1969 July 1969 August 1969	10,1° C	
	II B	October 1966 February 1967 April 1967 May 1967 November 1967 May 1968 October 1968 November 1968 October 1969	15,3° C	13,1° C
	II C	November 1966 December 1966 March 1967 October 1967 April 1968 May 1969	15,8° C	
III		January 1967 December 1967 January 1968 February 1968 March 1968 December 1968 January 1969 February 1969 March 1969 April 1969		19,6° C

ce of the algae-belt in relation with its grazing habits, leaving exposed surfaces for settling and further development of Balanus amphitrite. The harmful action of barnaciee of course, is increased at this level by the absence of antifouling paints.

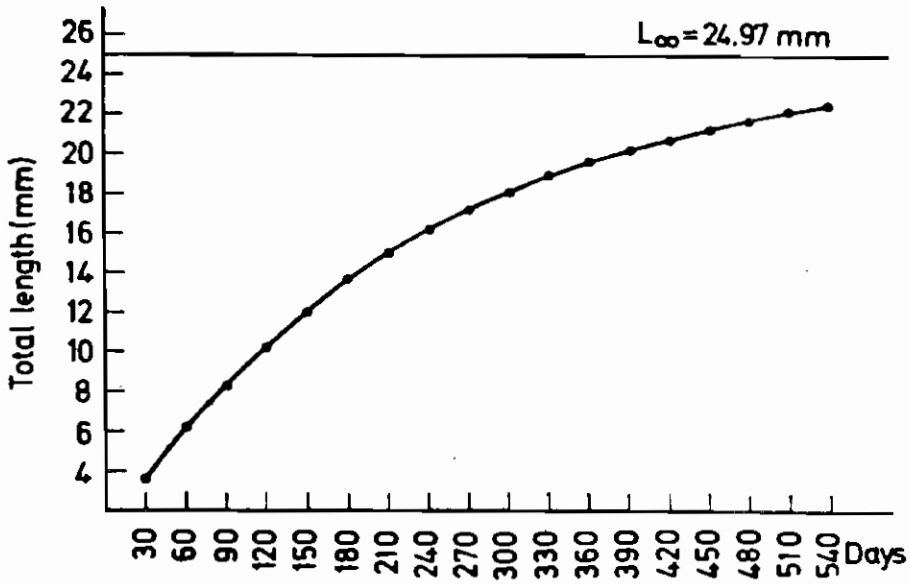


Fig. 5

Siphonaria lessoni: growth curve

Growths studies of Siphonaria lessoni (Fig. 5) also demonstrate that experimental rafts are excellent places for this kind of study and suggests that it could be used by biologists more often.

The applied methodology also allowed us to determine that growth rings are useless for the growth studies of this species, as they are not directly related to any characteristic biological process in this life, and can appear at an individual level at irregular intervals.

With regards to our interest on water-line panels, we studied the behaviour of antifouling paints at this level (8) trying to establish a long term investigation plan on this aspect. Preliminary results, actually in press, were promising and show a fair control of invertebrates and algae, despite the particular conditions of this interface level.

3. Belgrano's harbor

Belgrano's harbor is situated in the Bahia Blanca sound, at 38° S. Because of its geographical characteristics, this area offers a sheltered place for the establishment of numerous harbors, and at present we can find Galvan's harbor, Ing. White's harbor and Belgrano's harbor, the last one being the most important and located near the mouth of the sound.

High tides in this area reach from 2.6 to 3.6 meters, creating important currents and the exchange of water from the sound with that of the open sea. Although there are no important fresh water affluents, there are conspicuous draining areas during rainy months.

TABLE II

PRINCIPAL CHARACTERISTICS OF MAR DEL PLATA'S, BELGRANO'S AND MADRYN'S HARBORS

MAR DEL PLATA	BELGRANO	MADRYN
Lat.: 38° 03'18" S Lon.: 57° 31'18" W	Lat.: 38° 54' S Lon.: 62° 06' W	Lat.: 42° 46' S Lon.: 65° 02' W
Biogeographically belongs to the Argentine Province	Biogeographically belongs to the Argentine Province	Biogeographically belongs to the Magallanic Province
Tide amplitude: 0.9-0.6 m	Tide amplitude: 3.6-2.6 m	Tide amplitude: 4.7-2.9 m
Low tidal currents	Important tidal currents	Moderate tidal currents
Low turbulence	Low turbulence	Low turbulence
Reduced midlittoral level with hard bottoms (artificial and natural)	Extended midlittoral level with soft (muddy) and hard (artificial) bottoms	Extended midlittoral level with soft (sandy) and hard (artificial) bottoms
Water temperature with seasonal cycles	Water temperature with seasonal cycles	Water temperature with seasonal cycles
Salinity fairly constant with values near those of normal sea water	Salinity with important monthly variations	Salinity very stable, values similar to those of normal sea water
Dissolved O_2 values under those of normal sea water	Dissolved O_2 values similar to those of sea water	Dissolved O_2 values similar to those of sea water
pH values under the normal ones	pH values similar to those of normal sea water	pH values similar to those of normal sea water
Low water visibility	Very low water visibility	High water visibility
Abundant bioseston	Abundant abioseston	Scarce seston
Intersticial sediment of fouling (organic detritus)	Intersticial sediment of fouling (mudd and clay)	Intersticial sediment of fouling (calcareous and SiO_2)
Fouling communities with several local species	Fouling communities with several local species	Fouling communities with many local species
Fouling communities with a high grade of epibiosis	Fouling communities with a high grade of epibiosis	Fouling communities with a high grade of epibiosis
Growth rhythm of certain species very accelerated, communities of low stability	Growth rhythm of spccies near normal values, fairly stable communities	Growth rhyth of species normal, with development of very stable communities
Communities with bigh number of cosmopolitan species	Communities of high number of cosmopolitan species	Communities with very low number of cosmopol.species
High percentage of pollution indicating species	Low percentage of pollution indicating species	No pollution indicating species
Experimental raft on service	Experimental raft on service	No experimental raft

Maximum degrees of surface water temperature are obtained during December and January, reaching over 25° C. Minimum temperatures can be seen in June, with values under 3° C . The maximum monthly range of temperature is around 10°C, correspondig to June (Fig. 6).

Air temperatures reaches maximum readings generally during January, with temperatures above 30° C. Minimum temperatures are registered between June and August with readings under 0° C, the maximum monthly range being 20° C, in June and August.

Salinity shows conspicuous variations along the sound. Sometimes very high values (41.35 °/oo) can be observed, the minimum being 18.86 °/oo. This amplitude is due to the exchange of waters with the open sea, rainfall and evaporation. Also salty terrestrial areas of the environe play an important role as they contribute with important quantities of salt to be sound during rainy months.

The pH is stable during the year and its values (7.8 - 8.6) are similar to those of normal sea water.

The water in this area has an important content of inorganic suspended particles. The highest readings can be acquired during rainy days, as the rain erodes the intertidal muddy bottom increasing the suspended sediments.

The general hydrological conditions of Belgrano's harbor and surrounding areas are quite different from those observed in Mar del Plata's harbor, and consequently differences can be expected in this fouling communities.

The preliminary studies in this area start in 1967 over an experimental raft (9). Samples were taken from 20 x 30 cm achrilic sanded panels, immersed from surface to 1,30 m depth at three different levels. Studied samples of that year belong to 6 and 12 month immersed periods.

These preliminary studies allowed us to detect that fouling communities in Belgrano's harbor were quite aggressive, showing some important variations with regards to those of Mar del Plata's harbor. Some species which were very common and always present in high number (Caprella penantis, Caprella equilibra, Botryllus schlosseri, Bugula neritina, incrusting Briozoa, Plumularia setacea, Eupomatus dianthus, etc.) were never even seen in Mar del Plata or only occassionally. Other species always present in Mar del Plata's harbor (Mercierella enigmatica, Idotea baltica, Balanus trigonus, Siphonaria lessoni, etc.) were not detected in Belgrano's area.

Results obtained during preliminary studies can be observed in the table III.

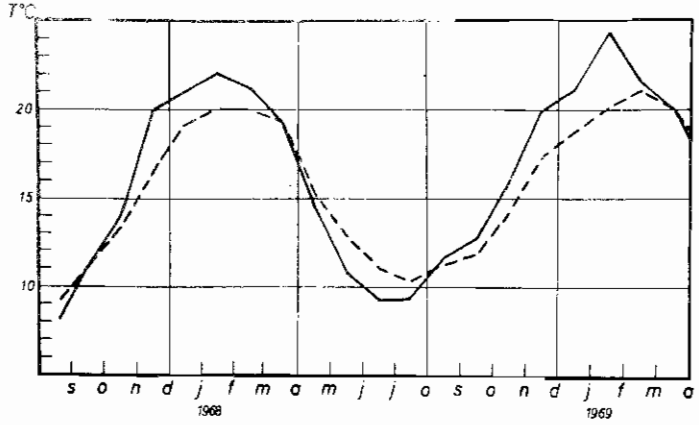
Based on this studies we planned investigations on a new raft with different characteristics in order to obtain more extensive data. Recently the first year of observations on the new raft have concluded and the results will be published in the near future.

This last cycle indicates that the fouling in Belgrano's harbor is really aggressive, having less effect on monthly panels only during the coldest months. Fouling on long term panels is always important and reaches high biomass values.

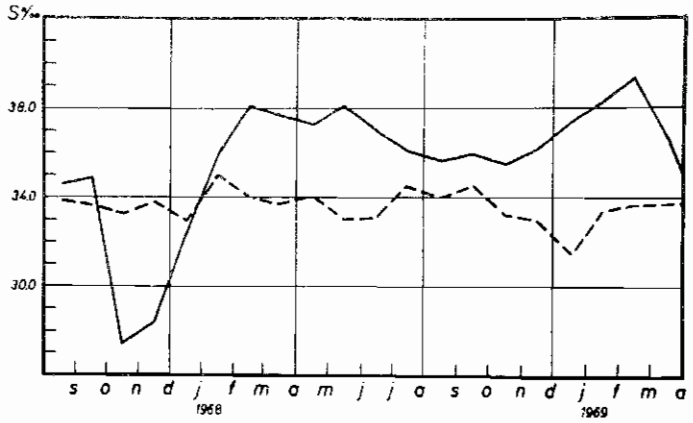
4. Powerstation at Quequen's harbor

For the first time a fouling problem was observed in the water refrigerating system of a powerstation on the Argentine coasts. We are asked for information on the biological problem and possible ways of control.

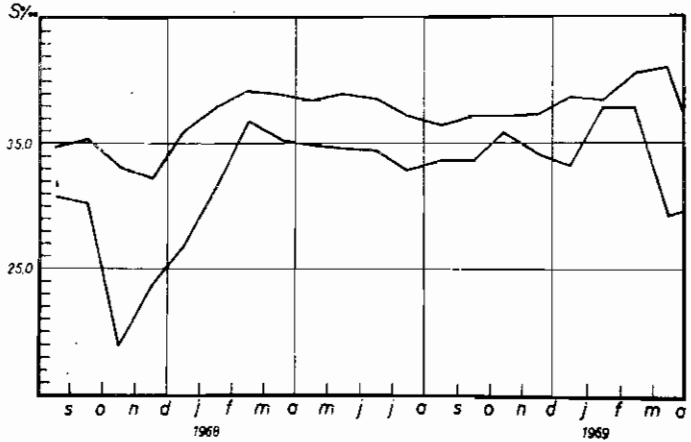
Quequen's harbor is located to the south of Mar del Plata's port, and not very far from it. This area is scarcely known in relation with its benthic communities and



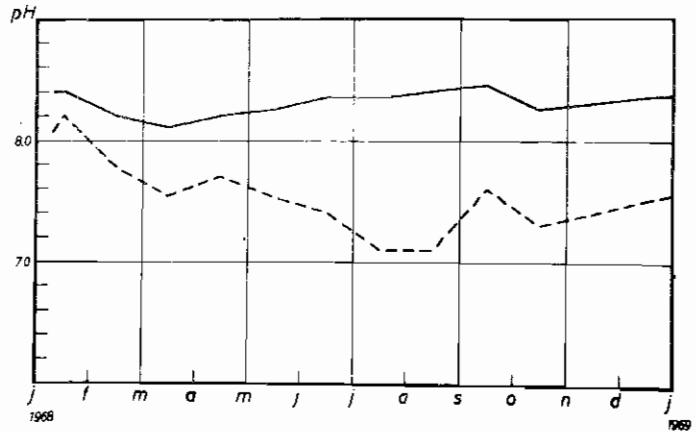
Monthly average temperature of water



Monthly average salinity



Monthly salinity (maximum and minimum)



Monthly average pH of water

Fig. 6.- Hydrological conditions of Belgrano's and Mar del Plata's harbors

—— Belgrano's harbor ----- Mar del Plata

TABLE III

BELGRANO'S HARBOR RAFT. FOULING ORGANISMS REGISTERED IN THE PRELIMINARY STUDIES(1967)

Species	Number of individuals or relative abundance				
	Medium panel	Lower panel	Upper panel	Medium panel	Lower panel
	6 months observations		12 months observations		
ALGAE					
Enteromorpha intestinalis...	-	-	VC	R	-
Enterom. cf. prolifera.....	-	-	R	R	-
Cladophora sp.....	-	-	-	R	-
Petalonia fascia.....	-	-	VC	R	-
Ectocarpus sp.....	-	-	C	R	-
COELENTERATA					
Plumularia setacea.....	C	C	-	C	R
Gonothyraea inornata.....	-	-	-	R	R
NEMERTEA (indet.)	4	-	5	4	3
ANNELIDA					
Hydroides sp.....	8	-	-	-	-
Eupomatus dianthus.....	21	6	-	12	-
Eupomatus plateni.....	5	3	-	2	1
Serpula vermicularis.....	-	1	-	-	-
Halosydnella australis.....	10	31	4	13	18
Syllidae	30	41	12	38	41
Nereidae	-	-	4	-	-
MOLLUSCA					
Pododesmus rudis.....	-	5	-	-	-
Brachyodontes rodriguezi....	-	4	-	1	-
Pyrene paessleri.....	-	1	-	-	-
Littoridina australis.....	-	-	1	-	-
CRUSTACEA					
Balanus amphitrite.....	1580	341	350	1132	386
Corophium sp.....	55	16	>300	210	93
Gammaridea indet.....	8	28	>300	50	17
Caprella cf. penantis.....	10	1	5	2	-
Caprella cf. equilibra.....	111	15	-	8	9
Sphaeroma sp.....	-	-	19	-	-
Exosphaeroma sp.....	-	-	1	-	-
Cyrtograpsus altimanus.....	25	89	3	3	1
Pilumnus reticulatus.....	-	1	-	-	-
INSECTA					
Chironomidae larvae.....	-	-	13	-	-
ENTOPROCTA					
Pedellina cernua.....	-	-	-	-	R

TABLE III (cont).

BELGRANO'S HARBOR RAFT. FOULING ORGANISMS REGISTERED IN THE PRELIMINARY STUDIES (1967)

Species	Number of individuals and relative abundance				
	Medium panel	Lower panel	Upper panel	Medium panel	Lower panel
	6 months observations		12 months observations		
BRYOZOA					
Bugula neritina.....	-	C	R	C	C
Bugula sp.....	-	-	-	R	R
Scruparia ambigua.....	-	-	-	R	R
Alcyonidium polyoum.....	-	-	-	-	R
Bowerbankia sp.....	-	C	C	C	R
Cryptosula cf. pallasiana...	A	VC	C	VC	VC
Canopeum sp.....	A	VC	C	VC	VC
TUNICATA					
Ciona cf. intestinalis.....	9	113	-	2	-
Molgula sp.....	-	-	6	17	20
Ascidea sp.....	-	-	2	-	10
Botryllus schlosseri.....	R	R	VC	VC	VC

Key of the table: A Abundant
VC Very common
C Common
R Rare

its waters are of a mixed type, receiving waters from the open sea and fresh ones from tbe Quequen River.

Its water temperature is similar to that observed in Mar del Plata, but its salinity goes from normal sea water values to low ones, specially during the rainy months. It also has an important daily variation dne to important tidal currents.

pH values do not modify notably during the year, and water oxygen also mantains normal values.

The possibilities of water excbange between the harbor area and tbe open sea eliminates o reduces the pollution problem, vinculated with tbe typical activity of that port.

Our observations in the tuhing system demonstrated an aggressive action of some foulers, principally of Mercierella enigmatica in the first section where sea water is injected in the system. In that section this species can form incrustations of 30 cm thickness. However the larvae originate in those inner areas were there is a marked influence of fresh water. In those natural bottoms Mercierella enigmatica forms compact aggregations of high density, and even reaches the point of forming stony masses of 50 cm or more in diameter. During the end of spring, summer and the

beginning of the autum, this species shows an important sexual activity. In that period when the water current flows in the direction of the sea, lavae penetrates in great number in the refrigerating system. Once attached, they accelerate their normal growth rhythm due to the continuous water flow that transports extra available food. they are able to reproduce in the tubings, but we do not know yet if the larvae can attach once again in the system.

Although we do not have information during the whole year, it is probable that the incrustations of Mercierella enigmatica diminish totally or in part during the coldeet months, at least this happens on the experimental raft in Mar del Plata'e area (2, 4).

The inner sections of tubings are colonized by another type of community, characterized by the presence of two Mytilids: Brachyodontes rodriguezi and Mytilus platensis, the last one never reaches the largest size of natural areas. They attach to the tubing wallsforming some areas of great density, but the fouling thickness never exceeds 5 cm. The attachment of these molluscs is mainly produced on the lateral sides of tubings, while the floor and roof are always practically clean. Other species that can be found between Mytilids are Pododesmus rudis, Balanus amphitrite, Cyrtograsus altimanus and Cyrtograpsus angulatus, but always in low densities. Both Cyrtograpsus are always of small size. Bigger individuals probably can not remain attached to the suhstratum due the water current.

The main problem at the powerstation is created by the presence of specimens of Mytilus platensis in the brass tubes of the condenser, as their presence creates particular currents that destroy those tubes. To replace them the powerstation has to stop for some days, reduncing its power production. Until thc moment we do not have information regarding whether this problem is created by valvcs of dead specimens transported by the water flow or if they belong to "in situ" attached specimens.

These general observations allowed us to outline an investigation plan of the fouling of the tubing and surrounding area that probably will be carried out in a near future. The use of doses of chlorine for the control of the fouling in the refrigerating system is suggested.

5. Madryn's harbor

Fouling studies in this area are quite interesting for several reasons. As we mentioned before thcre is no available fouling information for the Patagonian coast. From the biogeograpbical point of view it is very important as it is the limit between two biogeographical provinces: the Argentine province and the Magallanic province.

Madryn's harbor is placed in the Golfo Nuevo tbat covers approximately 2 200 km^2 and its mouth is quite narrow (12 km). Because of its great depth, absence of low extended bottoms and narrow moutb it constitutes an area of peculiar characteristics, different from the greater part of the Patagonian coast. Waters are generally calm, differing notably from the rough sea that predominates in most parts of the exposed Argentine coast.

Tides are of great importance in all the gulf. The vertical range of tides can exceed 4 meters, creating important currents near the mouth. Mean water monthly temperatures go from 9.7° C (in August) to 18.3° C (in february) (Fig. 7). Salinity values ranges around 33.5 °/oo and are stable throughout the whole year. Dissolved oxygen has normal values, while the pH values correspond to those normal of the sea water. Water visibility is very high, mean values are around 10 meters, but sometimes reach more than 20 meters. Suspended organic detritus are in low densities. All these

general hydrological characteristics clearly separate this area from the rest that have been studied.

Samples were obtained from vertical metallic wharf piles, from the highest tide level to the bottom, around 10 m depth. Also samples were obtained from two wrecks at 5 and 15 m depth.

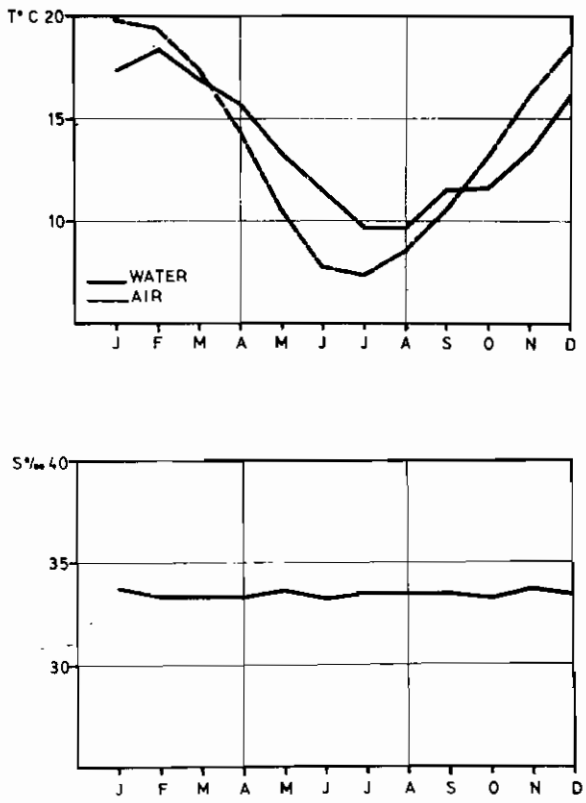


Fig. 7

Temperature of water and air, and salinity, Madryn's port

Due to the conspicuous tides, the wharf exhibits important intertidal communities. For a better exposition we shall make reference to fouling communities describing them from supralittoral level to infralittoral, based on Pérès's classification.

Supralittoral level.

This level is characterized by a Cyanophyta community where these algae are dominant species (Lyngbia aestuarii, Oscillatoria nigroviridis, Oscillatoria honnemaisonii, Phormidium fragile, Spirulina labyrinthiformis, Spirulina subtilissima, Calothrix crustacea, etc.). Among these algae and also at lower levels can be found Cbi-

ronomidae larvae and eggs. Cyanophyta generally form a very thin dark green film.

At lower levels and near to the limits of the midlittoral level, the Gastropod Siphonaria lessoni fringes the upper limit of the Enteromorpha sp. belt over which this species grazes. Individuals of Siphonaria lessoni reach bigger sizes at this latitude than in northern areas. The presence of Siphonaria lessoni over the algae belt confirms the observations made in Mar del Plata where the vertical distribution of the species depends on the algae belt limits (7). Both species, Siphonaria lessoni and Enteromorpha sp. continue their distribution in the following level.

Midlittoral level.

At the upper limit of this level generally is found Brachyodontes purpuratus that replaces Brachyodontes rodriguezi, a typical species of the northern coast of our country. Generally this species creates dense populations that give shelter to different species of invertebrates and also Siphonaria lessoni that grazes on epibiont algae and diatoms. Continuing down Brachyodontes purpuratus populations mixed with another Mytilid, Mytilus chilensis, a replacement species of Mytilus platensis typical of the northern coast.

When Brachyodontes purpuratus disappears in lower levels, and after some extention of pure aggregations of Mytilus chilensis, appears another Mytilus, Aulacomya magallanica (= A. ater), a mollusc of great economical importance that can reach great size. Between the masses created by mussels, generally can be found several species of crabs such as Cyrtograpsus altimanus, Halicarcinus planatus, the isopod Exospbaeroma sp. and the molluscs Fissurellidea hiantula, Patella magallanica and Gaimardia trapeziana. At this level, barnacles of different species also attach, among them the most conspicuous is Balanus psittacus, one of the world's biggest species. However this species is not found at midlittoral level in surrounding areas (10), probably because rocks in those areas are not hard and compact. In these places Balanus psittacus distributes itself in shallow waters in the infralittoral.

The algae of the midlittoral level is very important and such richness has never been registered in northern areas. Its qualitative and quantitative characteristics seen to vary notably during the year, but still many studies have to be done to establish the seasonal presence of species and also the acute vertical distribution limits.

Among the most common species we can mention: Enteromorpha sp., Ulva lactuca, Cladophora sp., Chaetangium fastigiatum, Nemalion helmintoides, Scytosiphon lomentaria, Polysiphonia spp., Ceramium rubrum, Ceramium sp. and also some of the Cyanophyta mentioned at higher levels but always in lower densities.

During our observations we could not find the two species typical of midlittoral level of the surrounding areas (10): Corallina oficinalis and Hildebrandia lecanellieri. Probably the metallic characteristic of the substratum was the reason for their absence.

Infralittoral level.

As it has been seen in natural areas of our northern coast the upper limit of this level is indicated also by the presence of Chlorophyta of Codium genus. This algae is represented in our sample area by three species: Codium fragile, Codium vermilara and Codium decorticatum, the last one quite uncommon in the wharf piles but more common in deeper water over one of the wrecks.

At this level can also be found the Mytilus chilensis - Aulacomya magallanica community, together with Balanus psittacus. At infralittoral levels is where Aulacomya magallanica reaches its maximum length, over 15 cm.

Associated with Codium fronds generally could be found two typical crabs, Leucippa pentagona and Rochinia gracilipedes and also the mentioned species Cyrtograpsus altimanus and Halicarcinus planatus. Many species of Gastropods are generally found at this level such as Patella magallanica, Tegula orbignyana, Trophon geversianus, Epitonium orbignyi, Fusus acanthodes, the chiton Plaxiphora aurata and several species of Serpuliuae and Spirorbinae worms.

Although the richest algae biomass is found at midlittoral level some species go deeper such as Polysiphonia spp., Ceramium rubrum, Ceramium sp., Pterosiphonia sp., Colpomenia sinuosa, etc., reaching a maximum depth due to the clear waters.

In wharf areas of low light intensity it is typical to find the presence of Lithothamnia covering the substratum as a paint film would. Also common in those places are another Rodophyta Rodhymenia sp., the luminescent anemone Corynactis sp. and the tunicates Ciona intestinalis and Ascidea sp.

Over the wrecks is commonly found the brown algae Dictyota spp. and in some occasions isolated specimens of Macrocystis pyrifera.

Our experience in the geographical area indicates that a great part of the Latinamerican coast is scarcely known in relation to fouling and marine wood-borers and the only way of solving this problem seems to be the creation of local investigation groups to carry out these studies in each country.

Perhaps using the last words of an exposition is not exactly the best way to call out for cooperation programs on fouling studies in Latinamerican countries.But anyways it is a means of communication, and if we get possitive results, one of the main objectives of this kind of congress will he obtained.

6. References

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